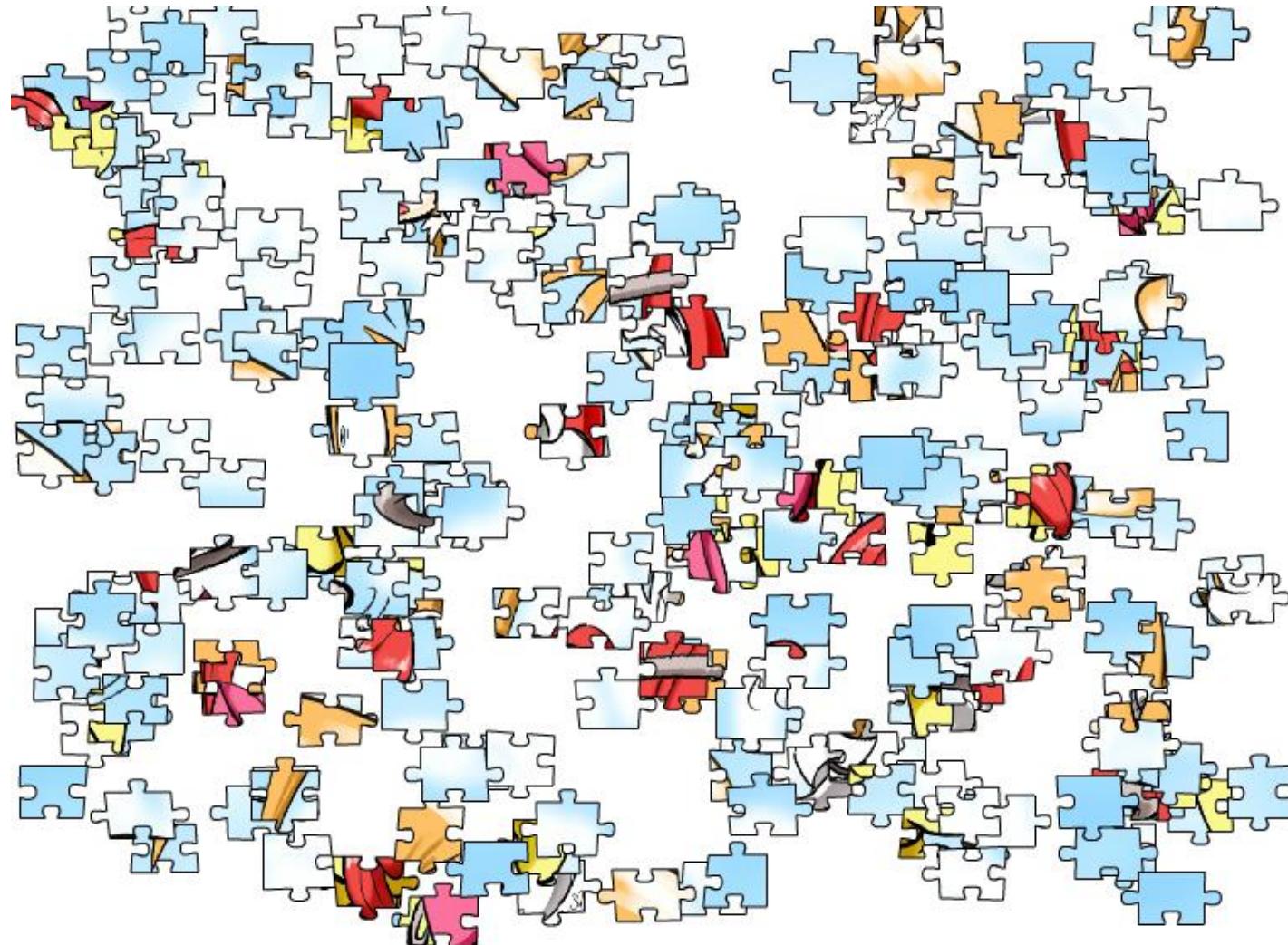
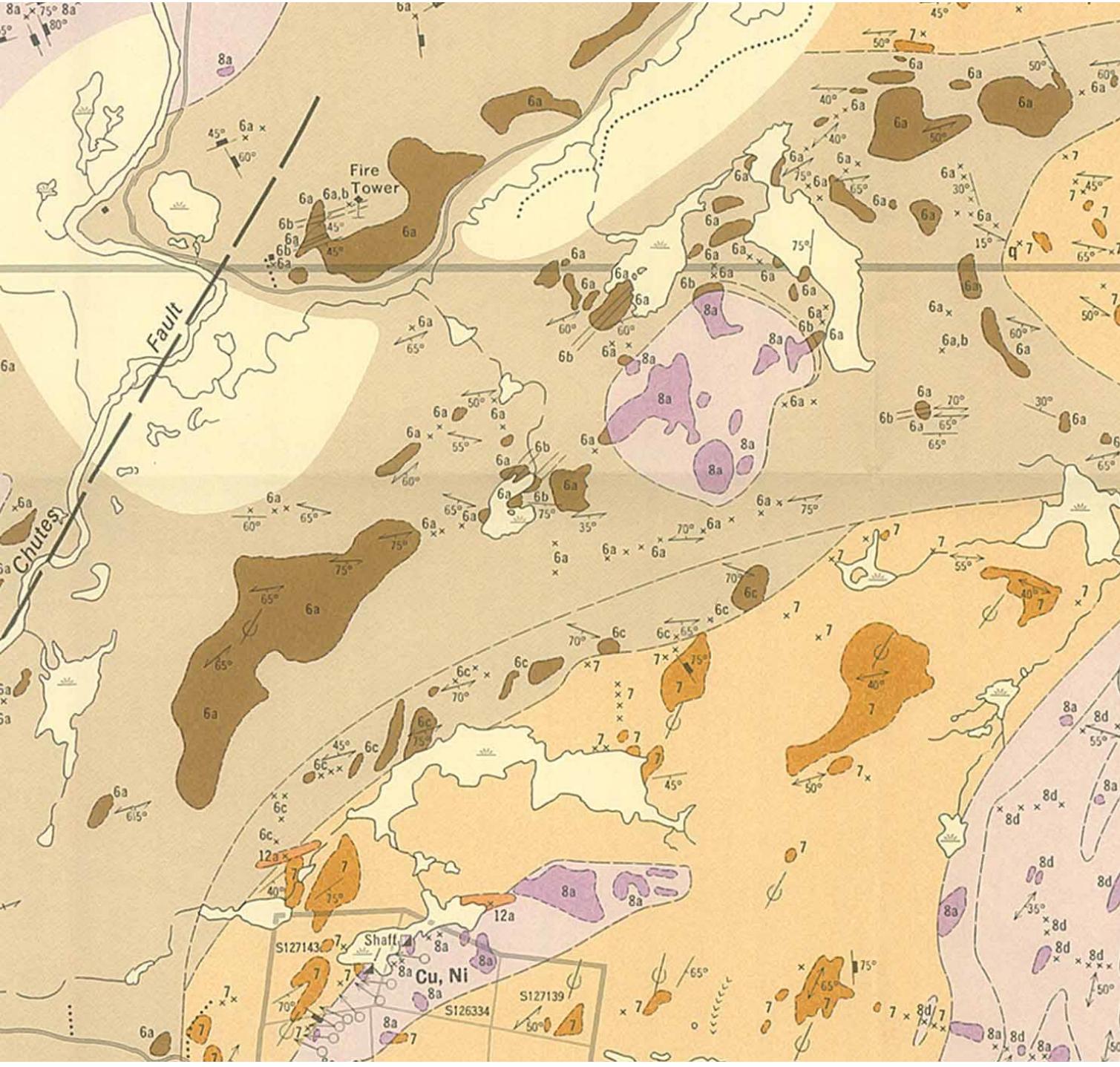


Some practical applications of Structural Geology

Application example 1: Data interpretation in mapping



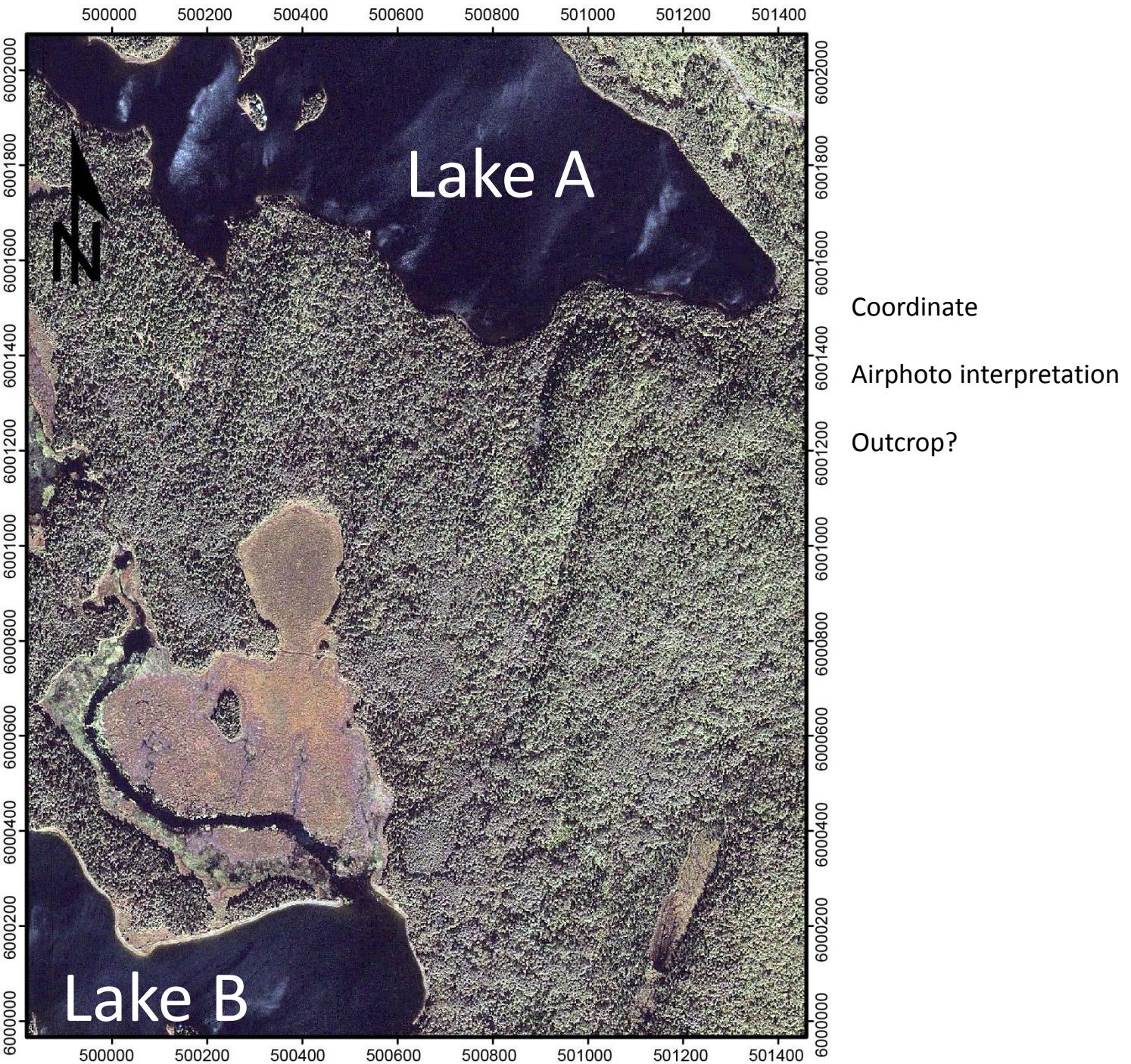


Dark color area:
Mapped outcrops;
Observation
Light color:
interpreted

Mapping; Placer gold; Conglomerate

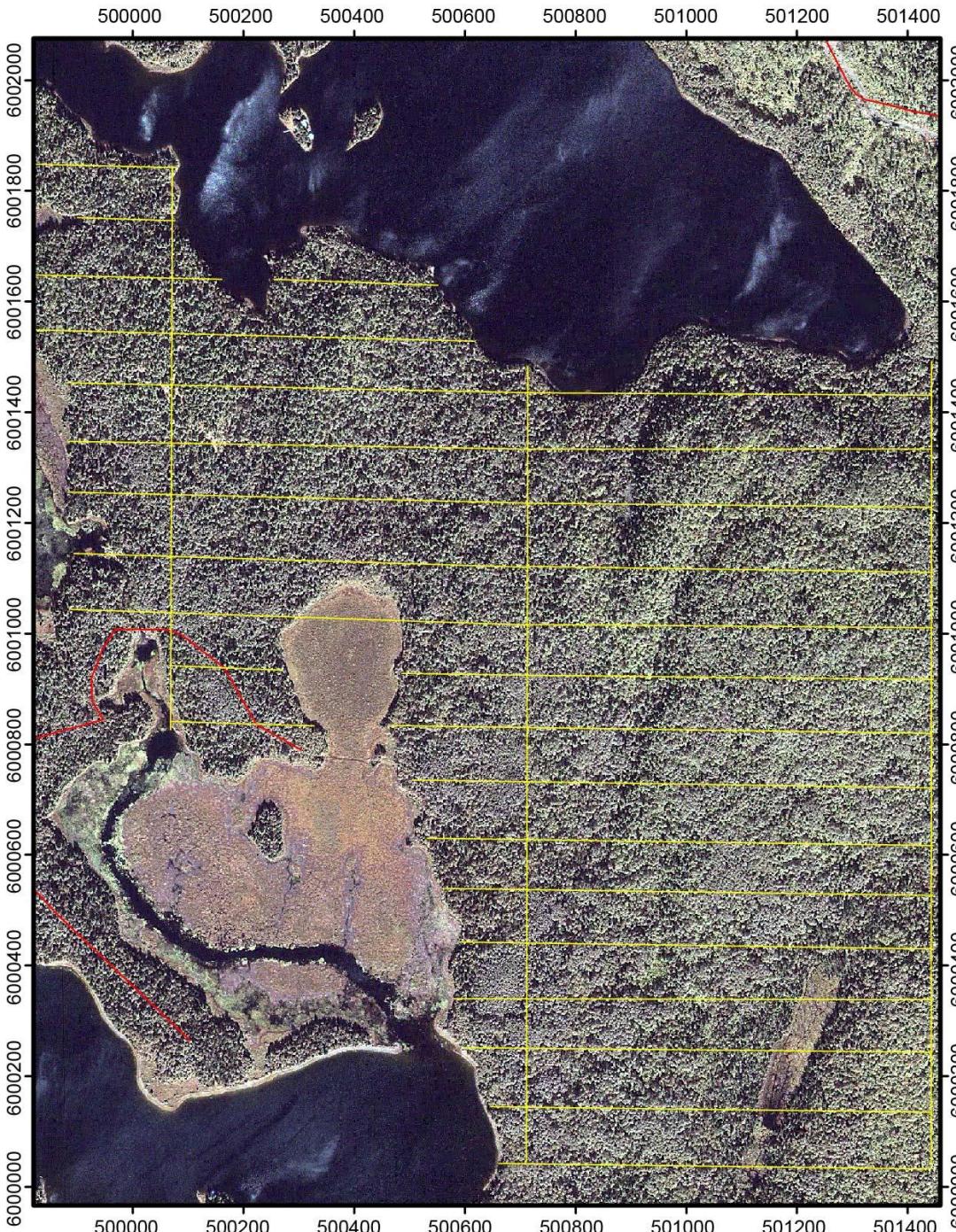


Placer gold:
Associated
with pyrite
and
conglomerate



Limited outcrops

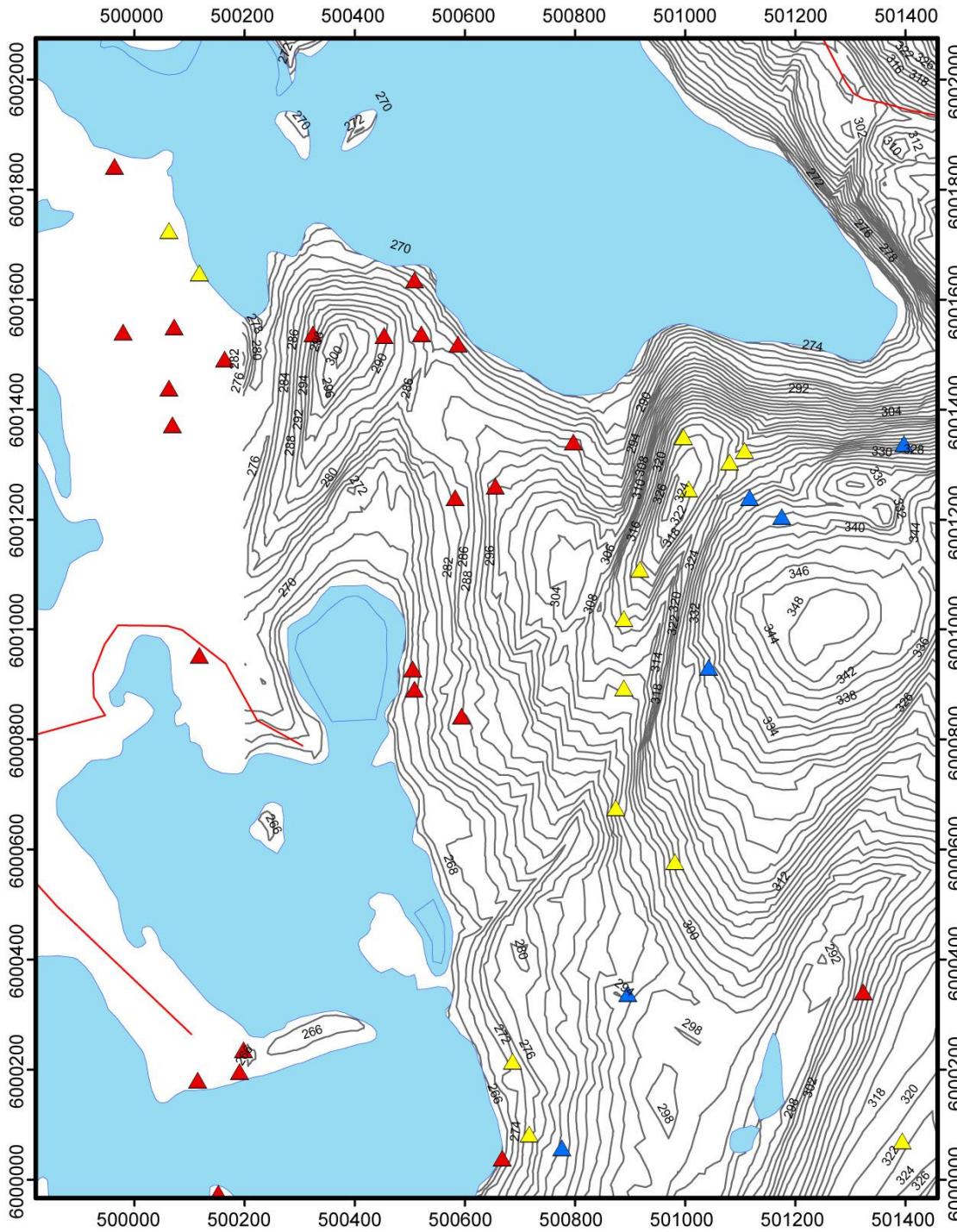




Yellow: Cutline

Red: Trail

Hike along the cutlines to map the area



Mapping data:

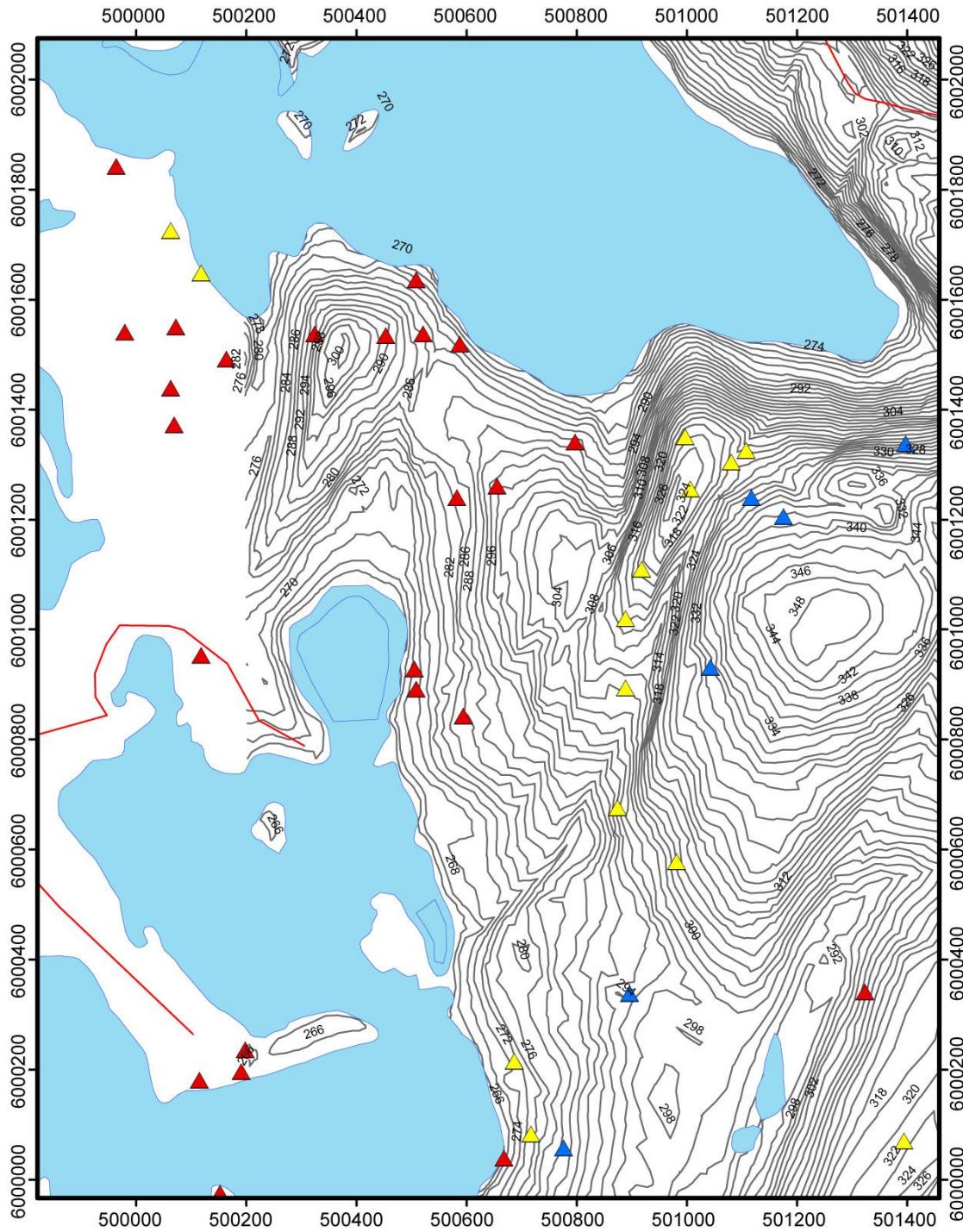
Triangles are outcrops

Yellow triangles:
massive sandstone

Blue triangles:
massive diabase
(Igneous intrusion)

Field photo of
outcrops indicated
by red triangles





Field data:

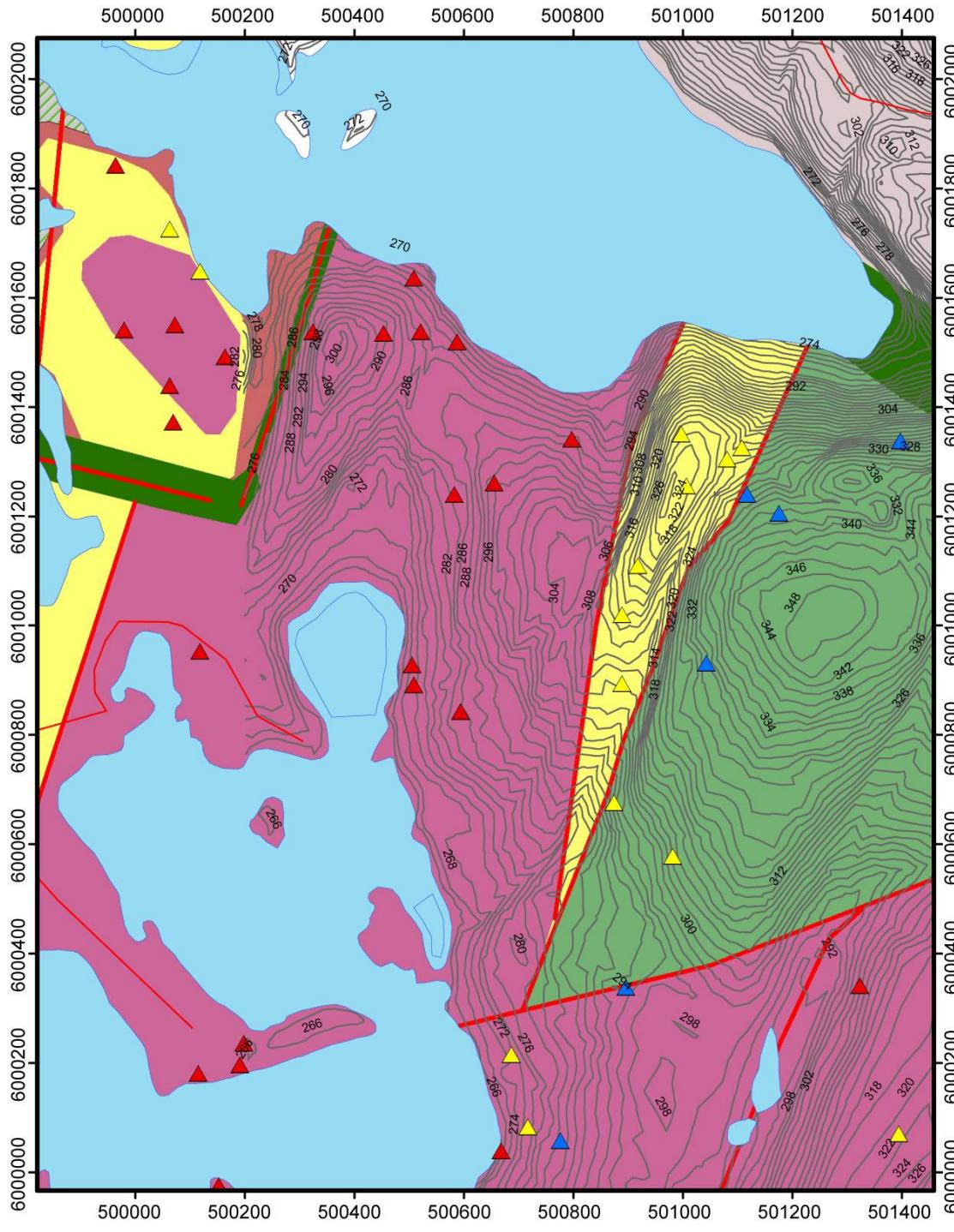
- Yellow triangles:
massive
sandstone
 - Blue triangles:
massive
diabase
(Igneous
intrusion)

If you map this area, how are you going to draw the map?

If you think more data are needed,
which area would like to visit?

Interpretation by geologist A:

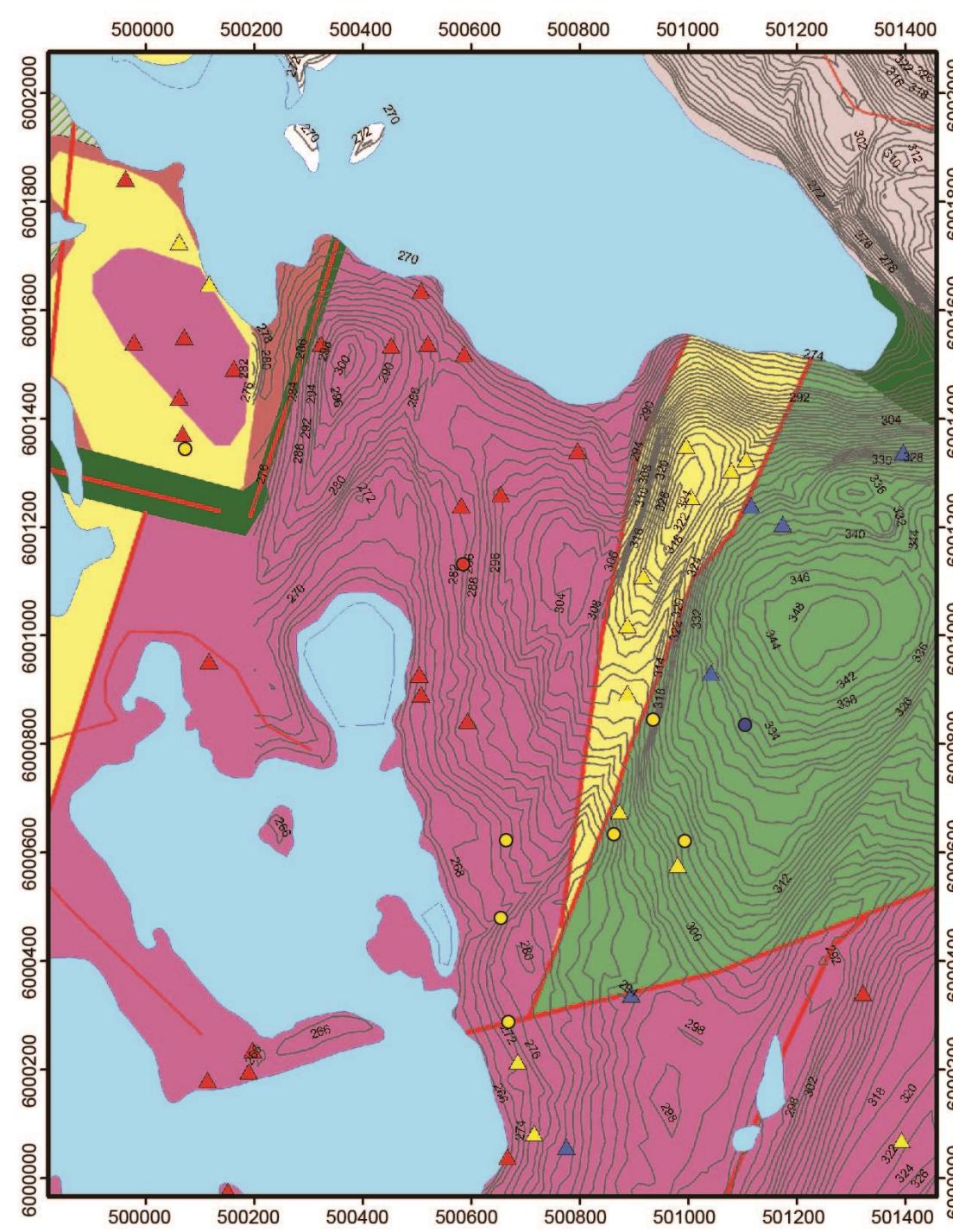
- Lithology is controlled by faults.
- Faults are interpreted based on topography



Do you agree with this geologist?

Sandstone and
conglomerate
belong to the
same
sedimentary
formation.

//

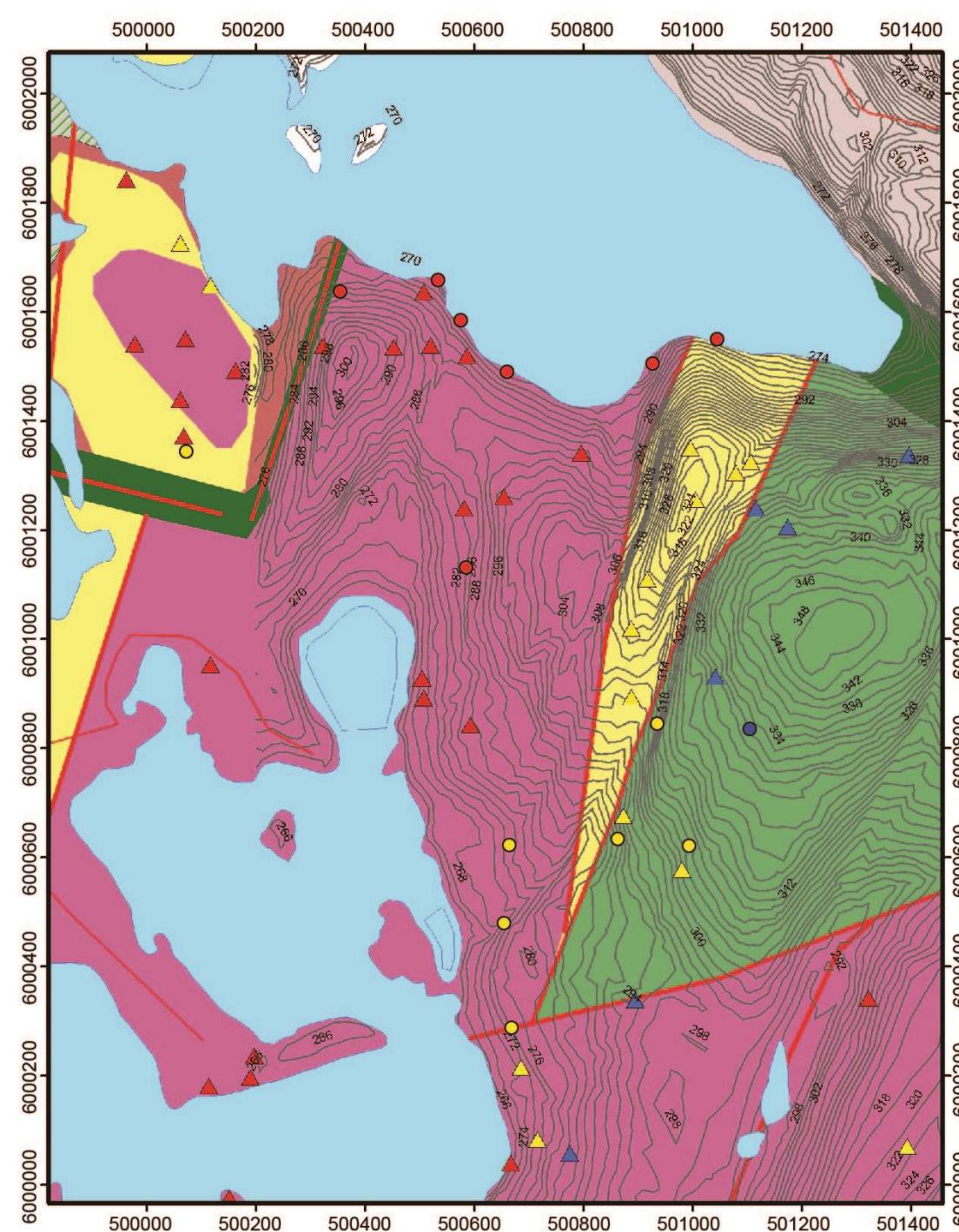




One outcrop

Vertical plane

Horizontal bedding



Summary of Example 1

- Mapping: understanding of available data
- Model-more data-new model
- May never know

Application example 2: Stratigraphic sequence based on borehole data

Drill hole #1 (Vertical):

0-44m: massive sandstone

44-50.73m: conglomerate

50.73-81.64m: mudstone

81.64-128m: sandstone

128-131m: conglomerate

131-144m: mudstone

144-154.5m: Foliated (vertical foliation)
metasediment in basement

68 m

78.84-81.64m



- Fault gauge
- fault breccia
- Foliation

Application 2: Stratigraphic sequence based on borehole data

Drill hole #1 (Vertical):

Structures:

At 68m bedding is recognized. Dip: 60 degree

87m Dip: 15

138m Dip: 10

At 78.84-81.64m Fault (fault plane dip: around 60 degree; striation is along dip line) is recognized.

Contact of mudstone&basement: subhorizontal

Other drill holes nearby all show subhorizontal bedding.

What is the stratigraphic sequence of the area based on the information from the core log?

What is the geological history?

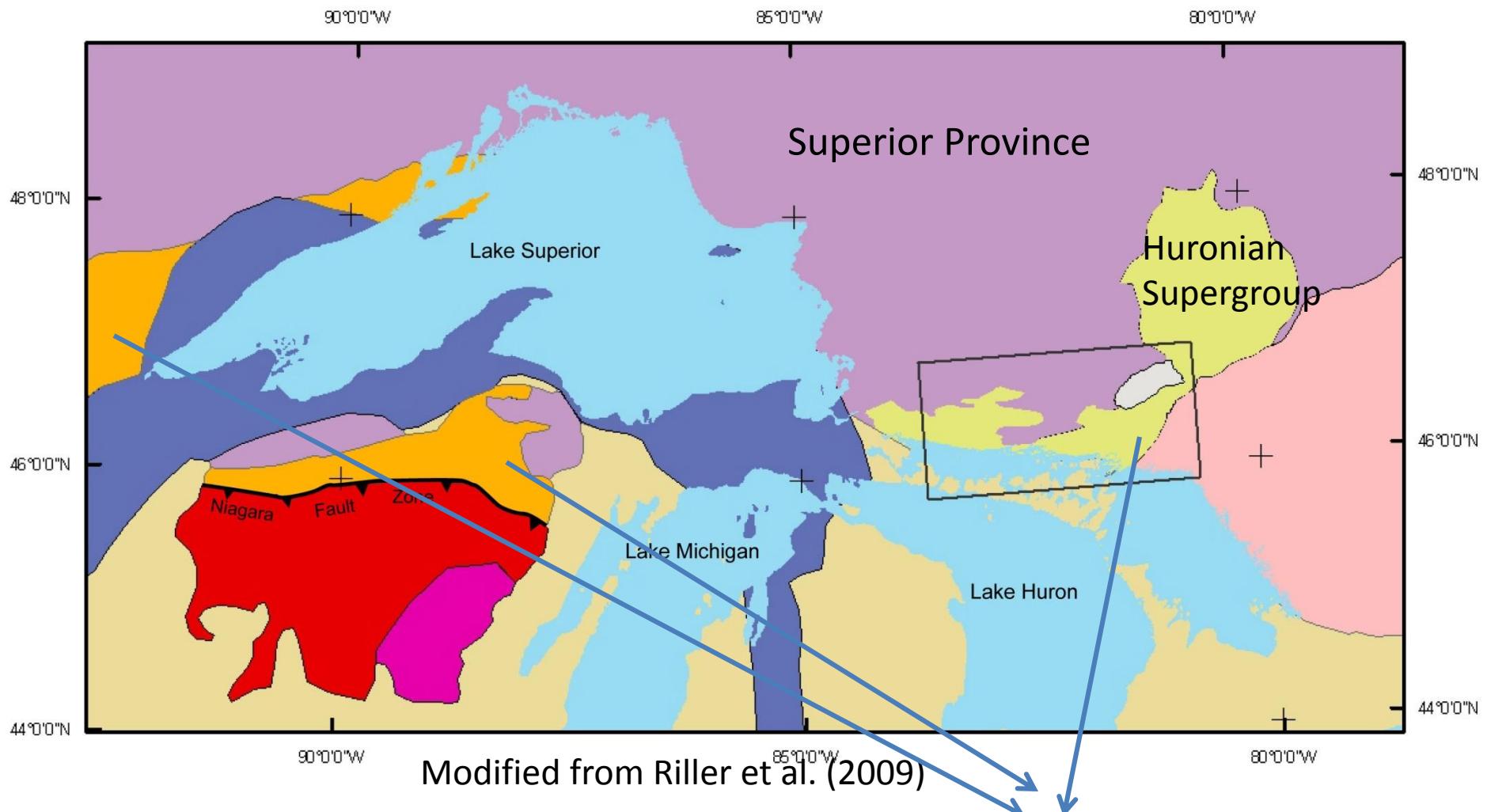
What type of fault is it?

Draw the drill section

Geological history

- Repeated sequence
 - Why?
 - History?

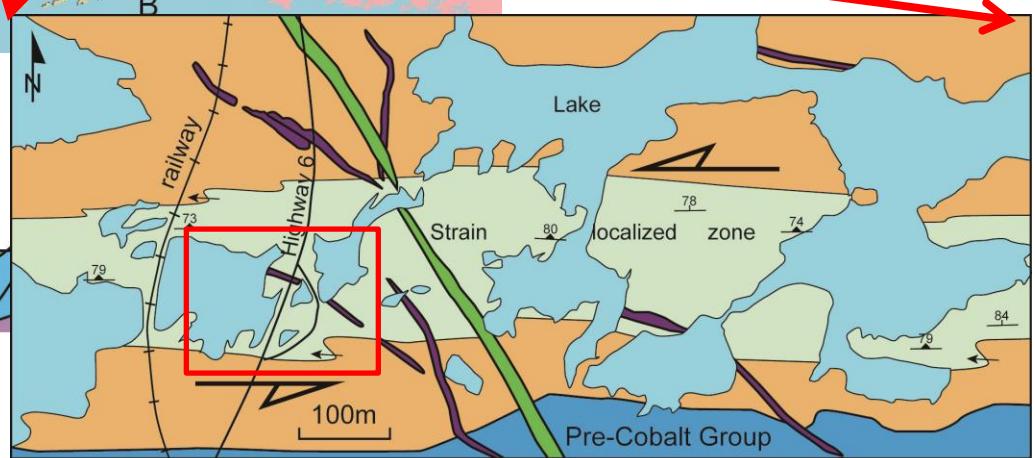
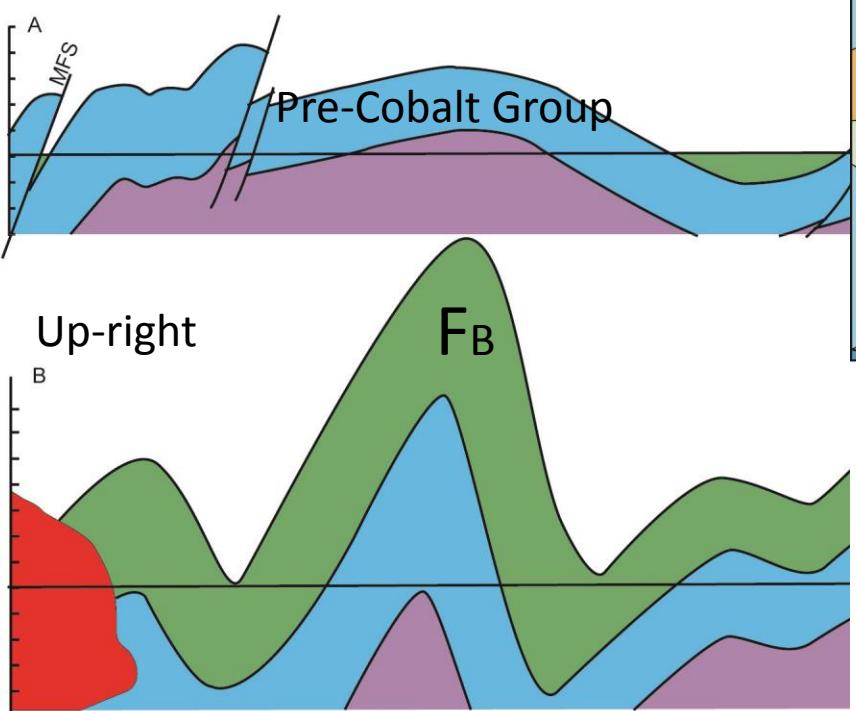
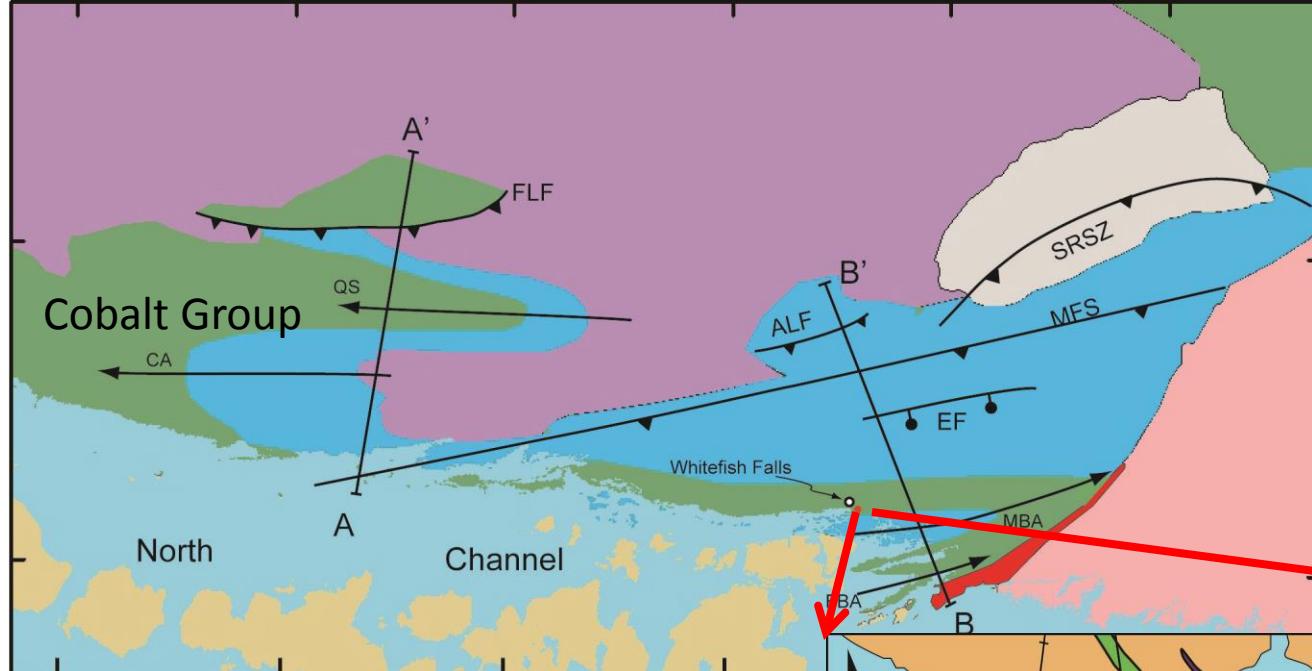
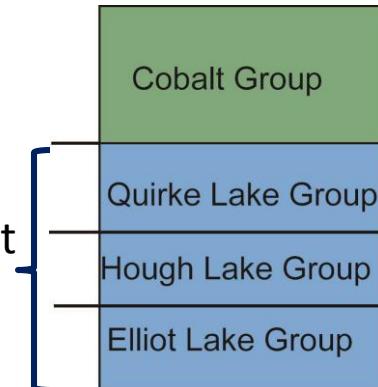
Structural analysis of folds and its tectonic significance: Southern Province



1890-1830 Ma Penokean Orogeny

East-trending regional folds

Huronian Supergroup



Gowganda sandstone,
diamictite, and argillite

Gowganda laminated argillite

2220 Nipissing dike

1238 Ma olivine diabase dike

Gowganda bedding
Cleavage

Fold axis
Gowganda Folds: FA

444700.000000

444750.000000

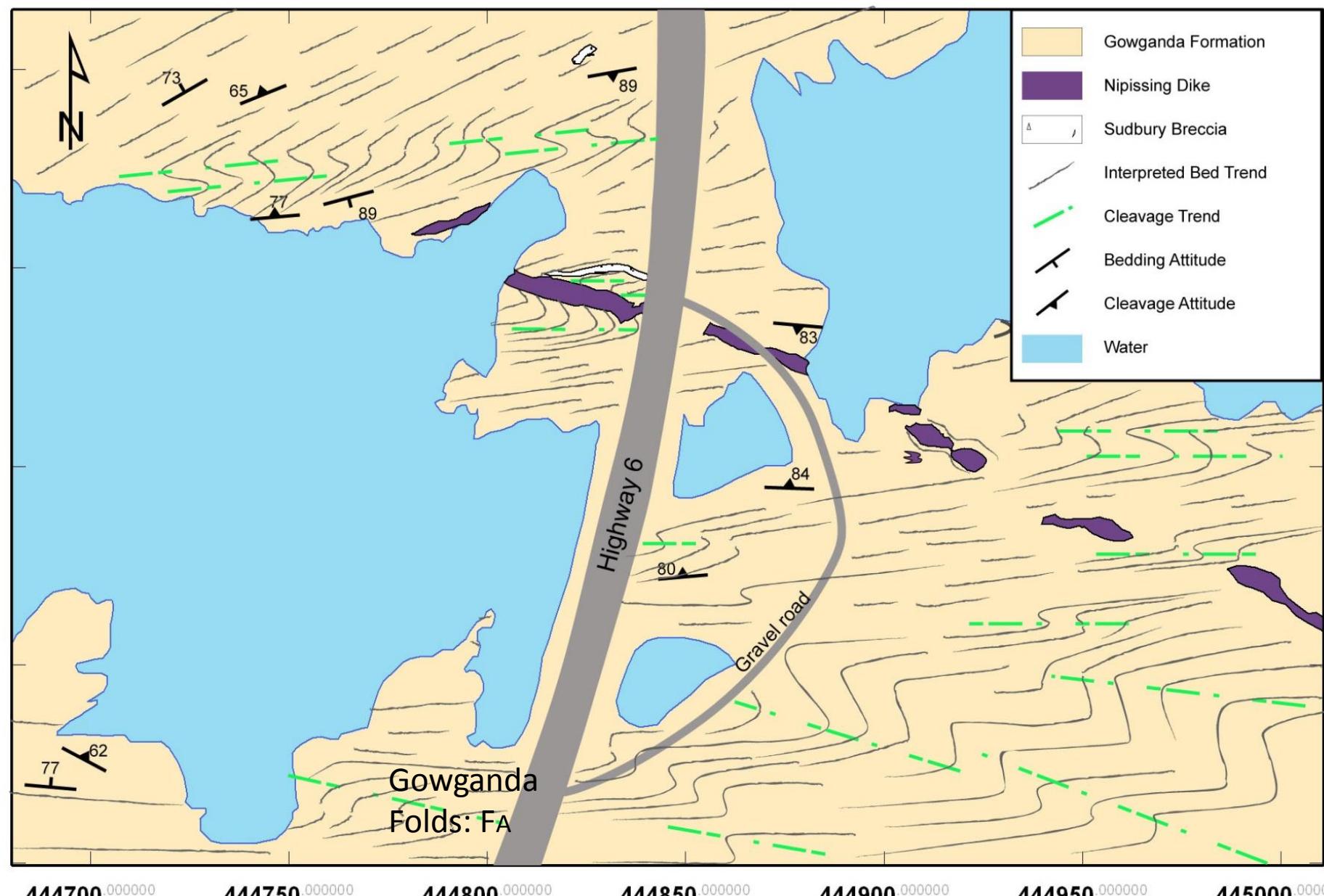
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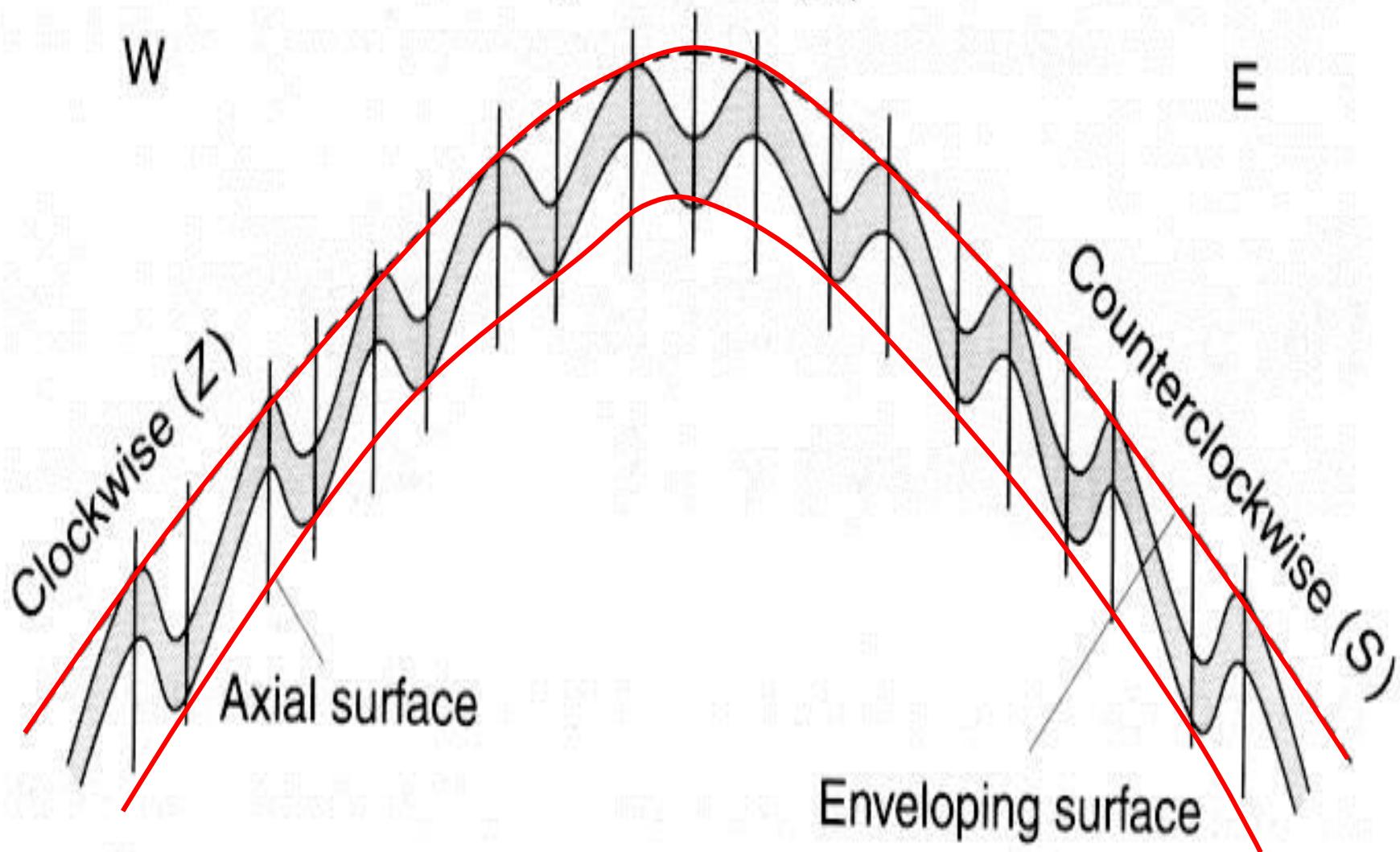
445000.000000

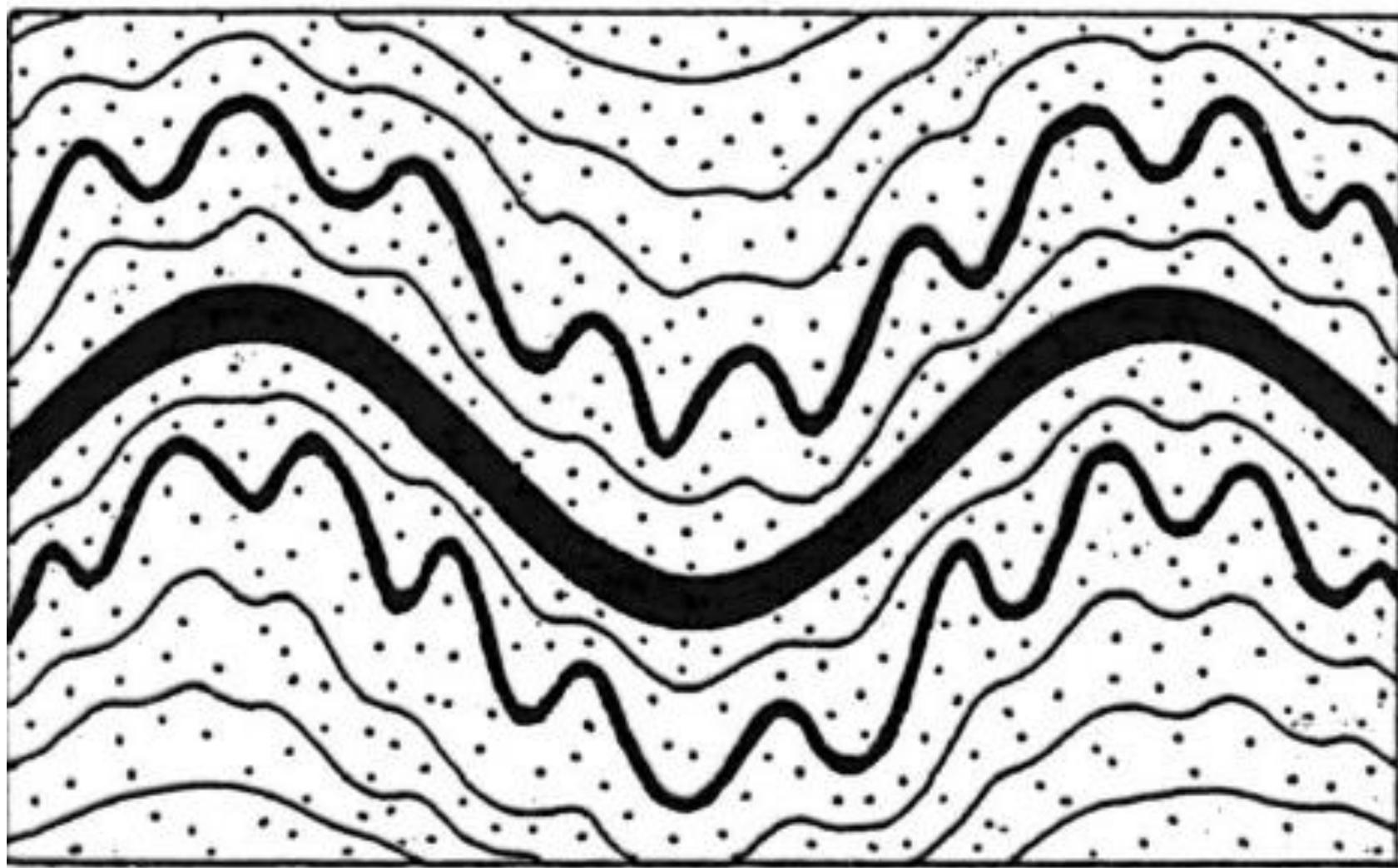


Datum: North American Datum of 1983

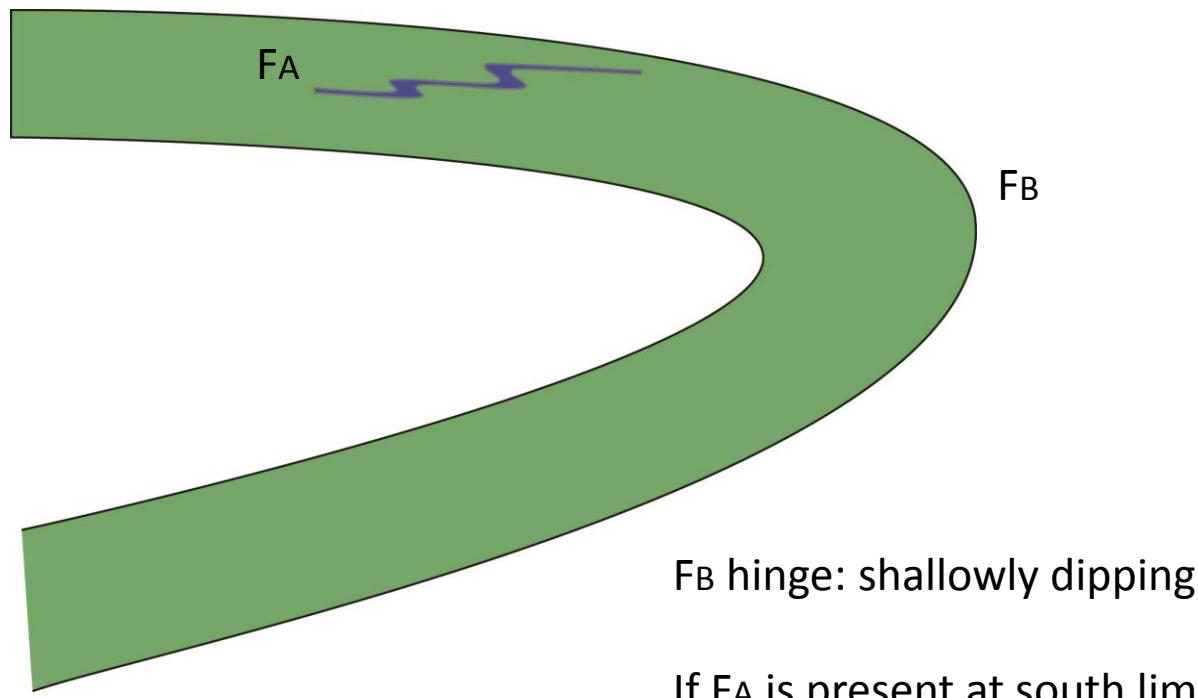
Projected coordinate system: UTM Zone 17N

Symmetrical (M)



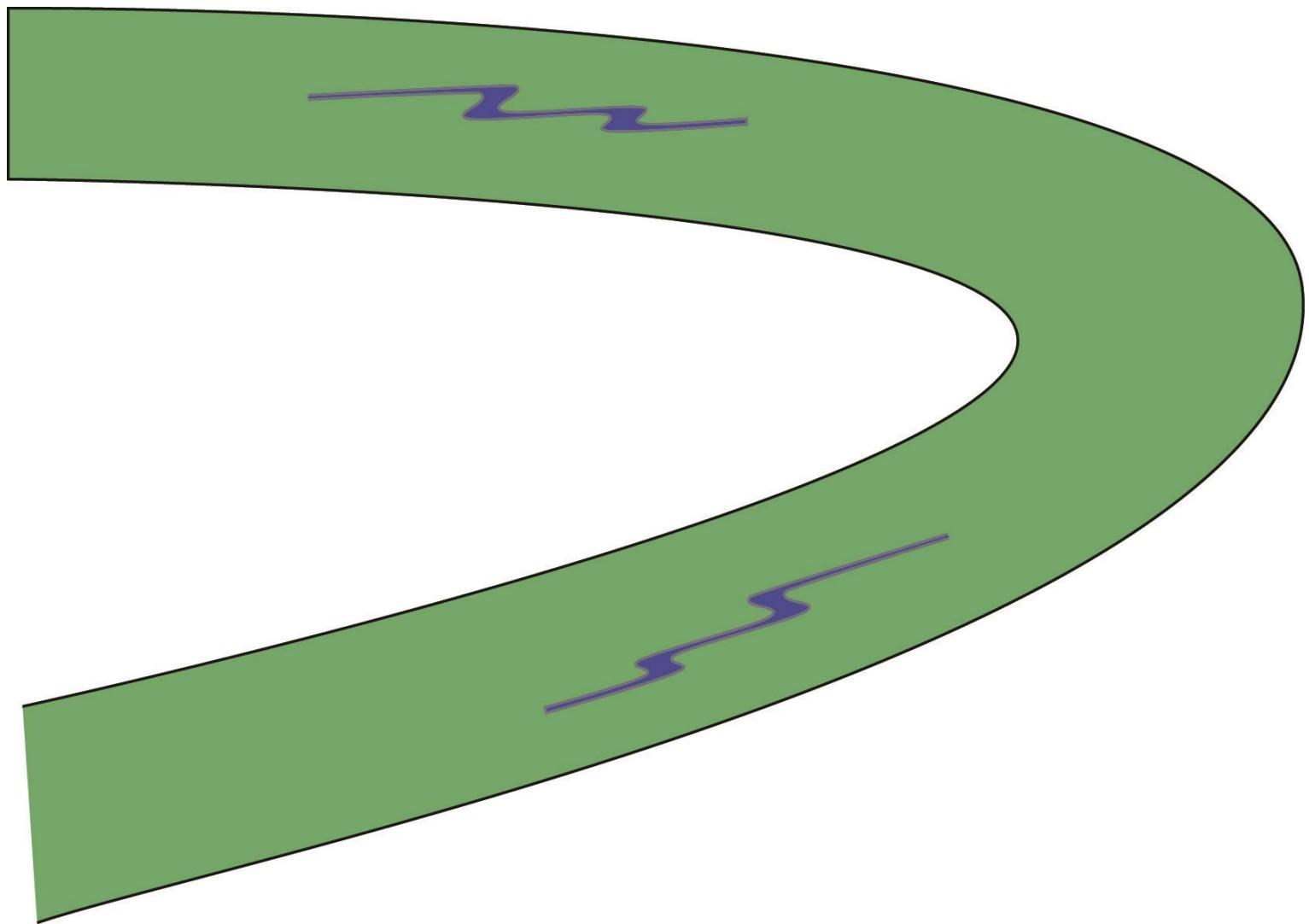


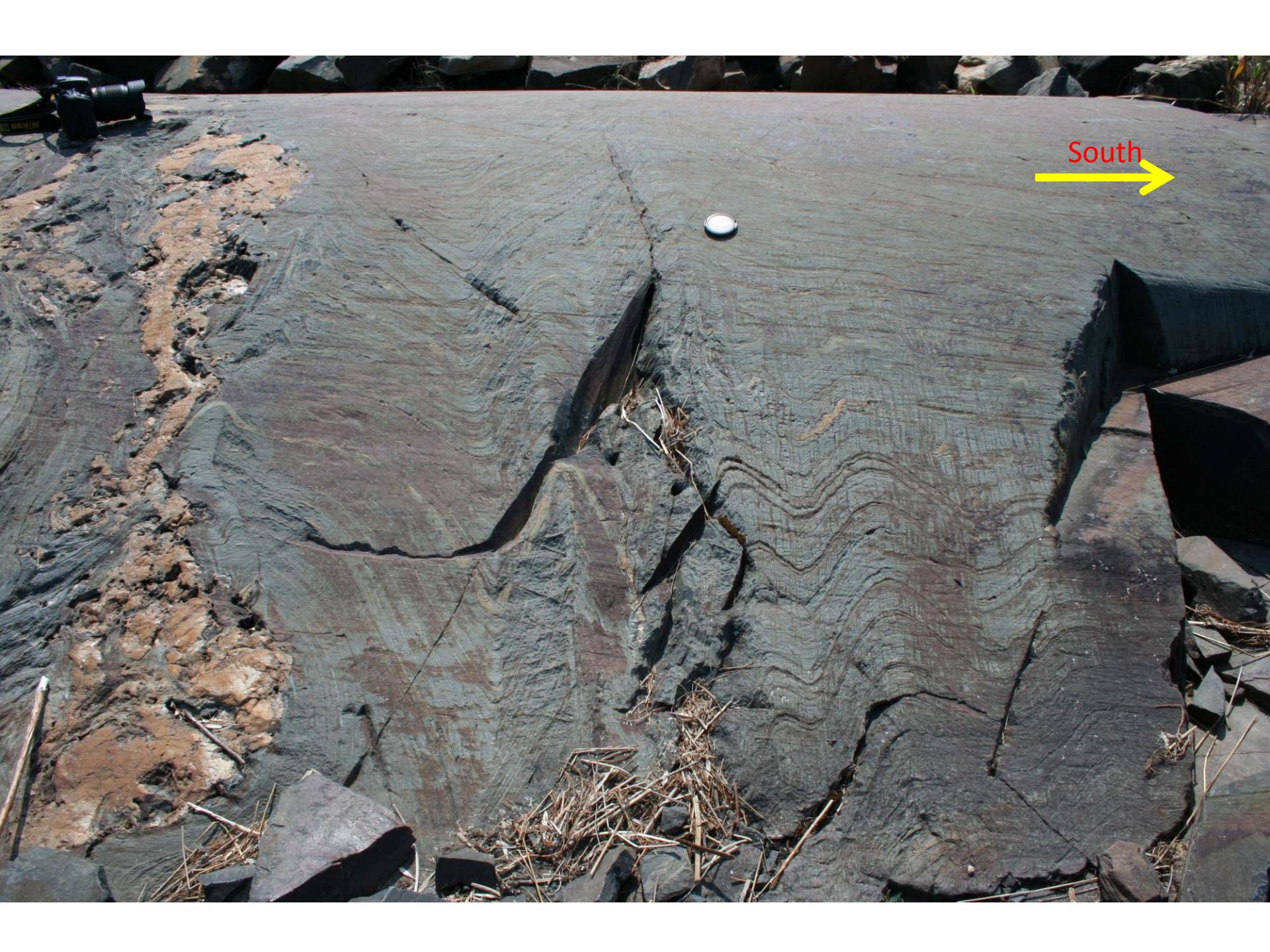
- Are F_A and F_B the same generation of folds?



F_B hinge: shallowly dipping

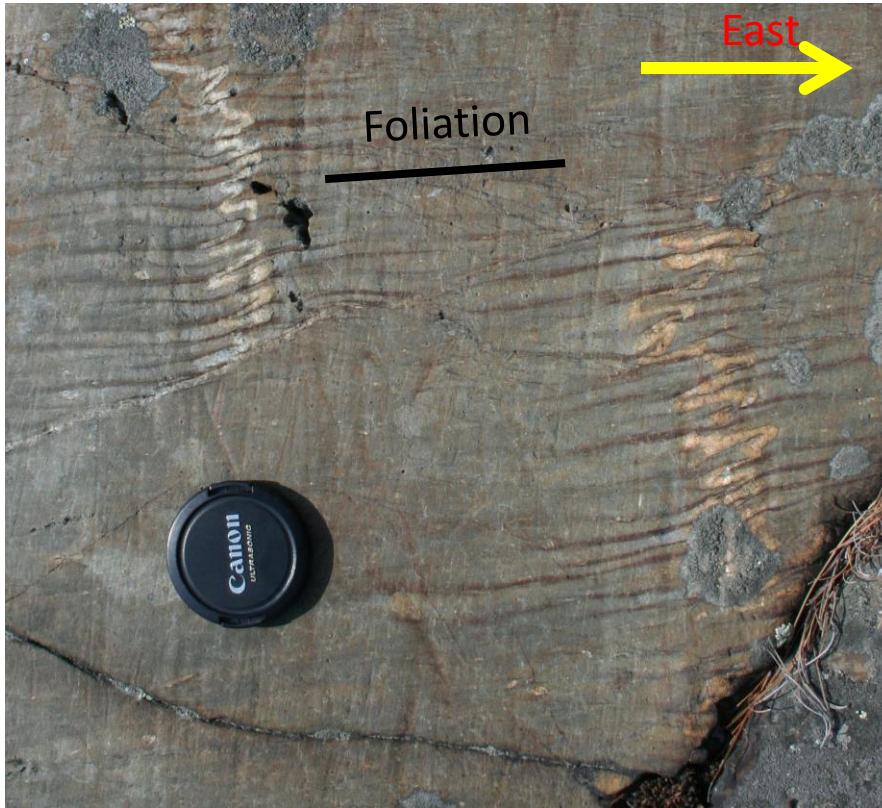
If F_A is present at south limb of F_B , what is its asymmetry?



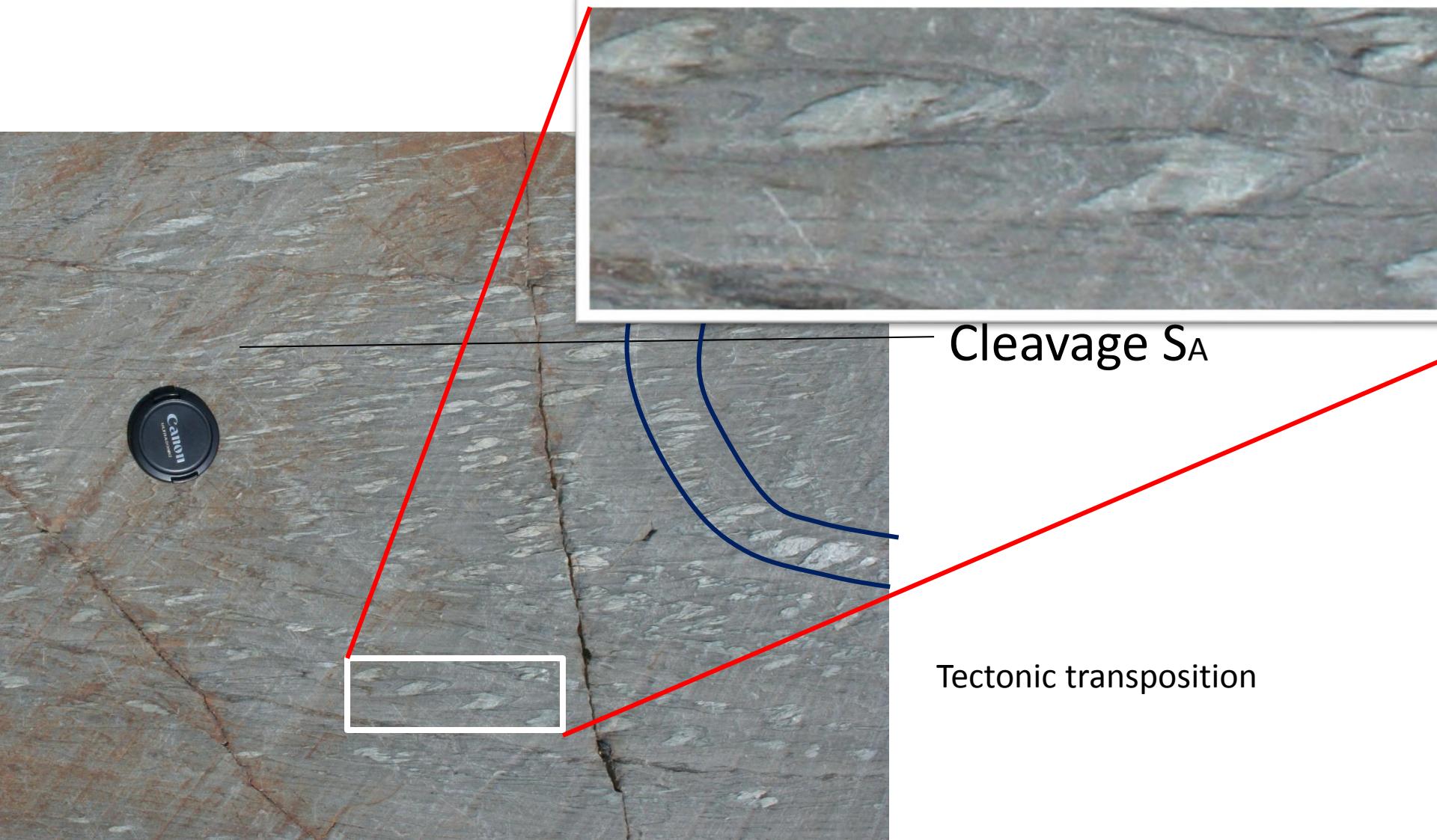


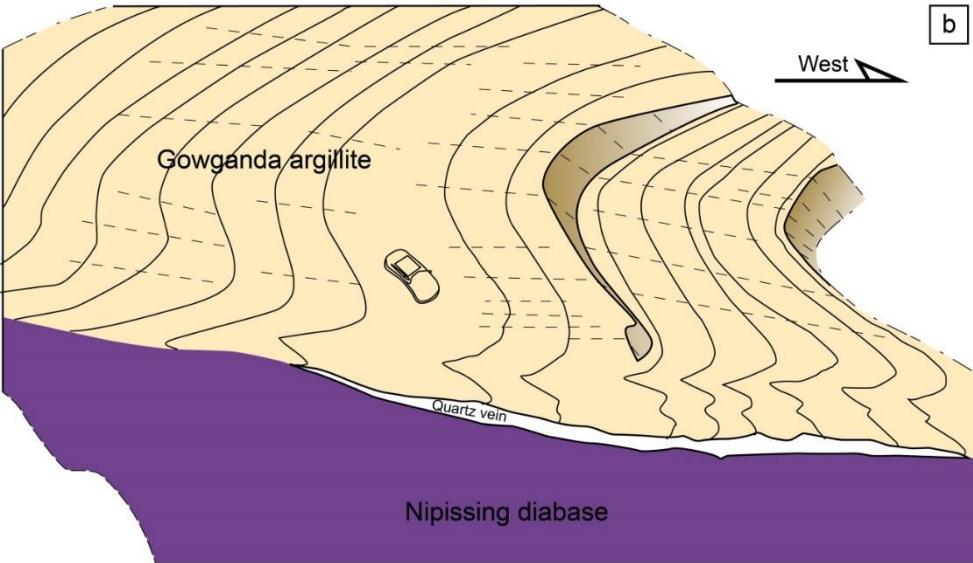
South

Gowganda Folds F_A : axial plane foliation



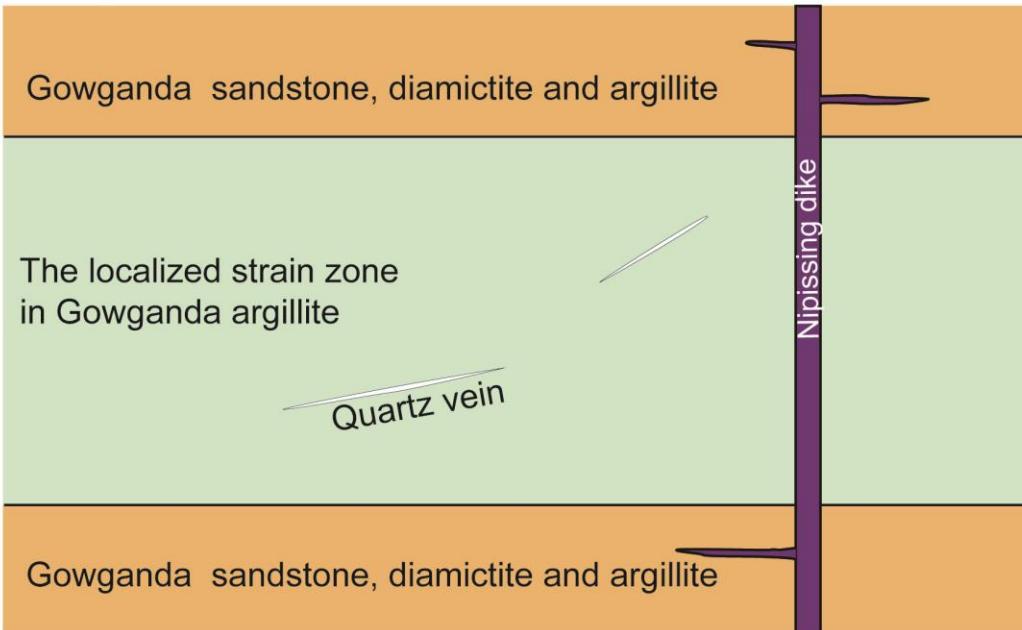
Tectonic folding





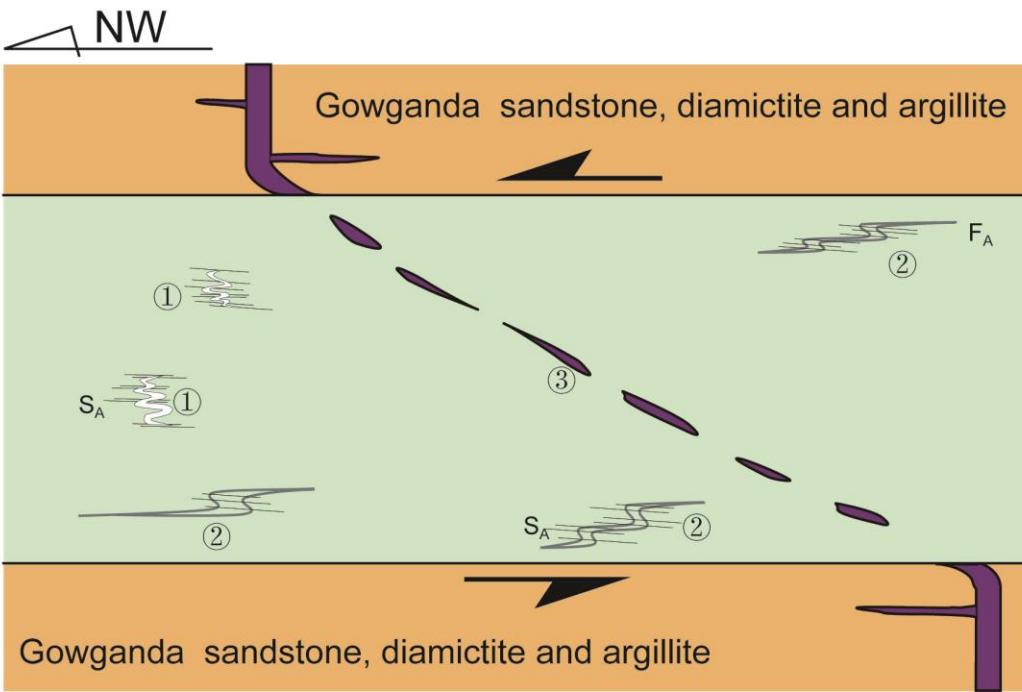
Did Nipissing dike intrude in the argillite before folding or after folding?

a

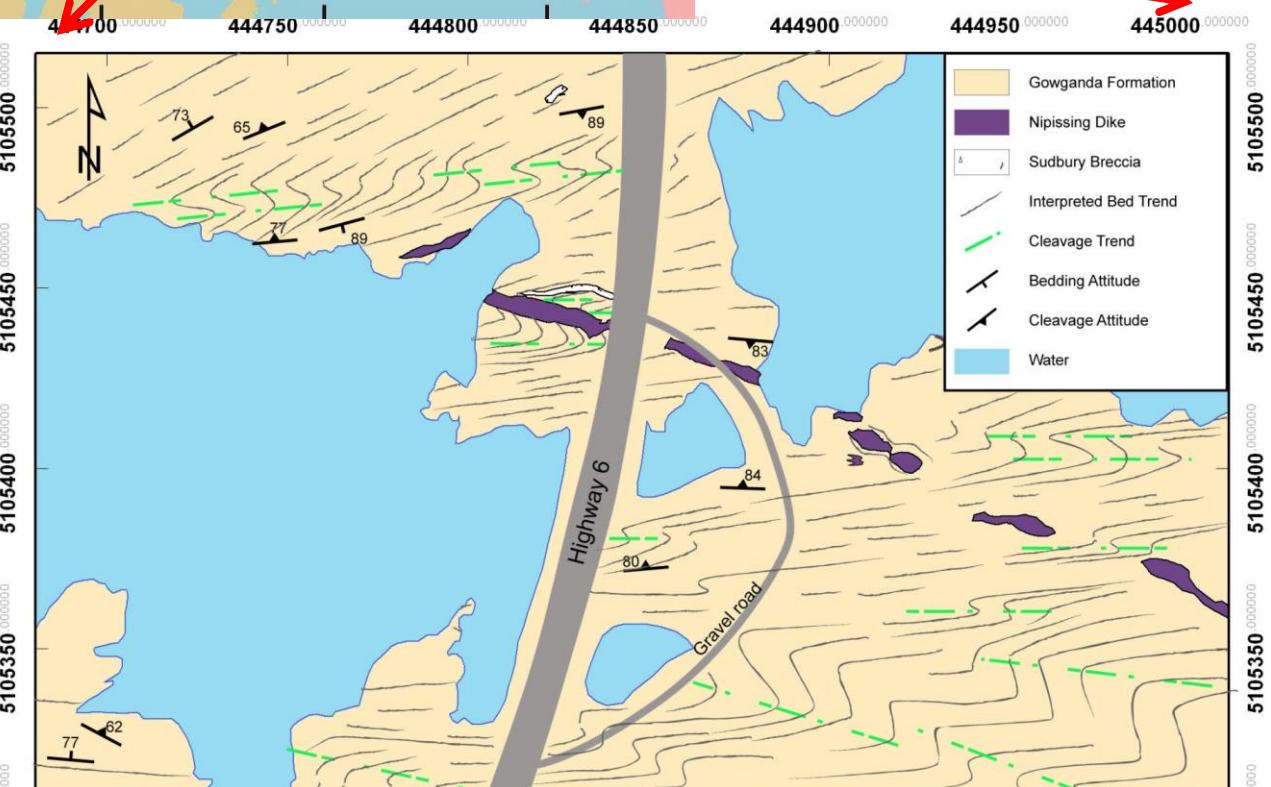
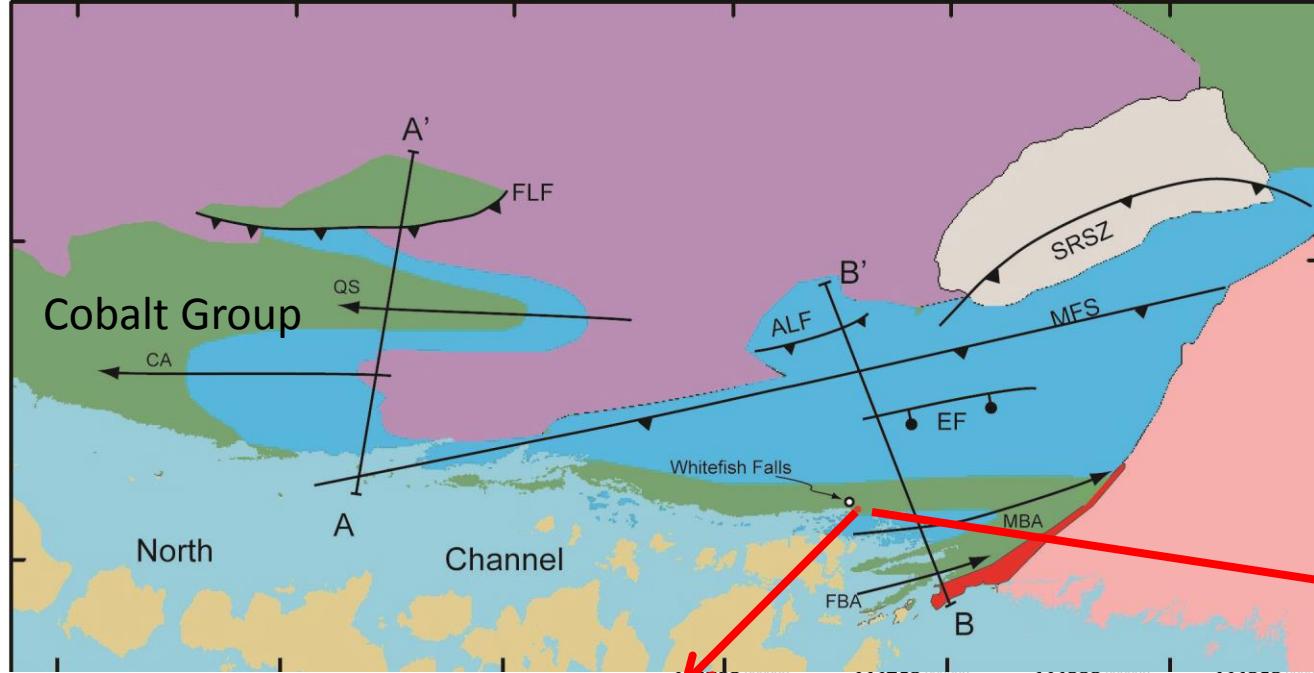


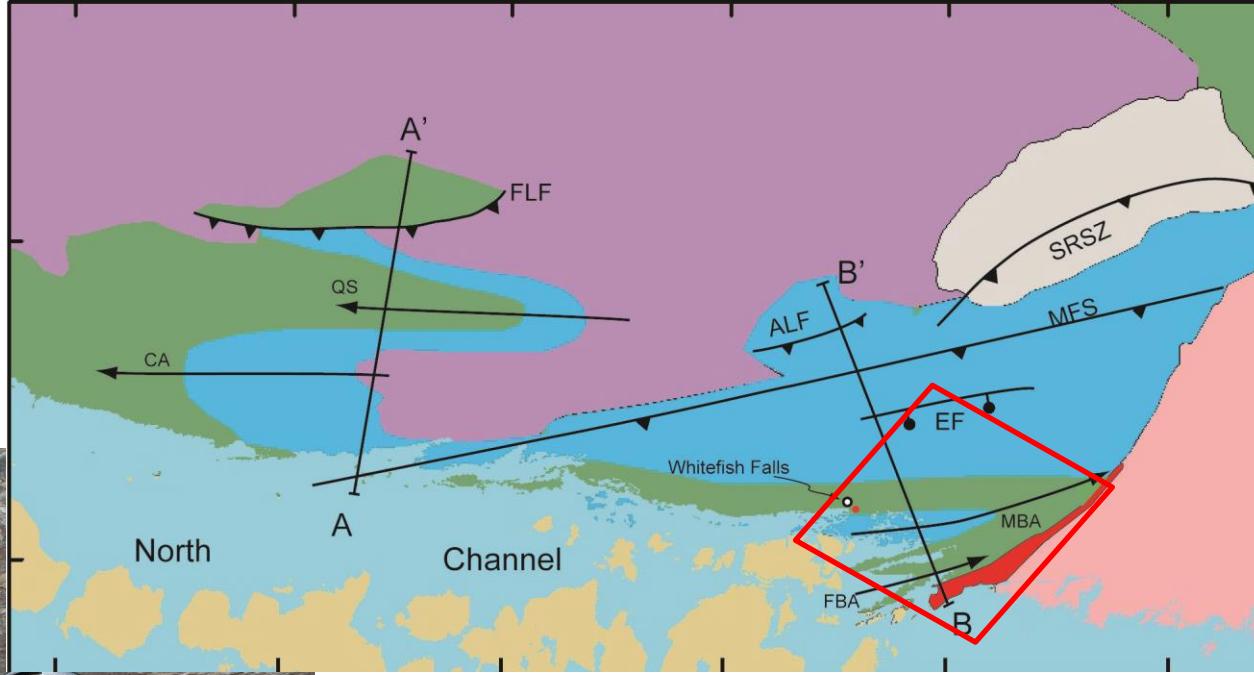
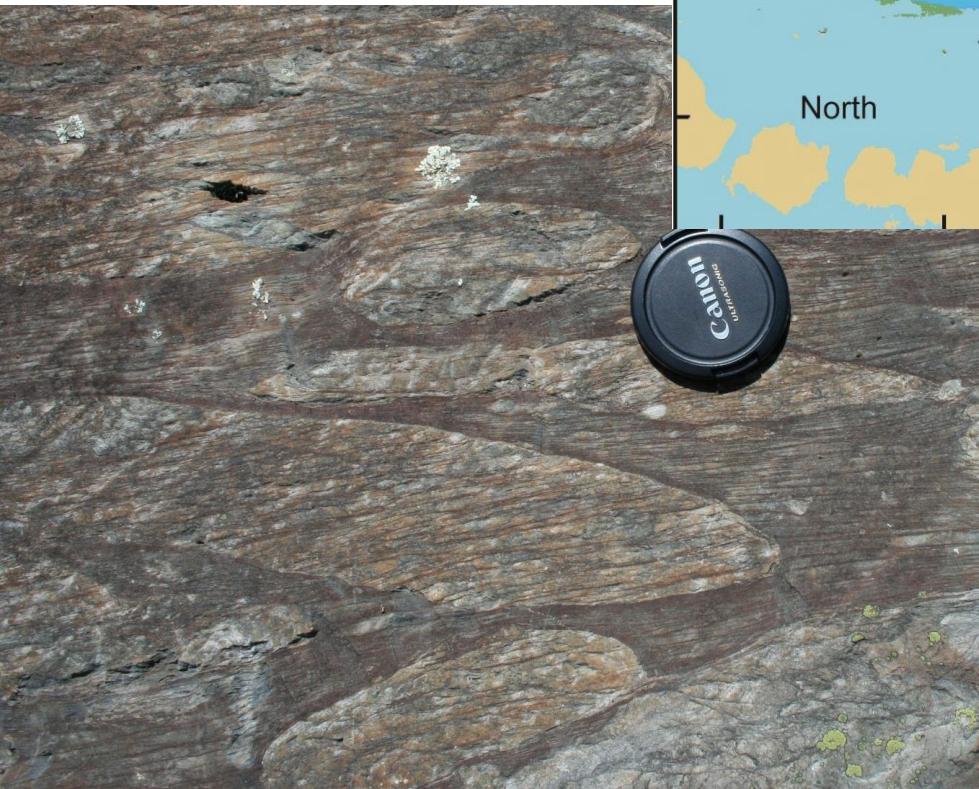
Kinematic Interpretation

b



Bedding-parallel
shearing within the
strain localized
zone



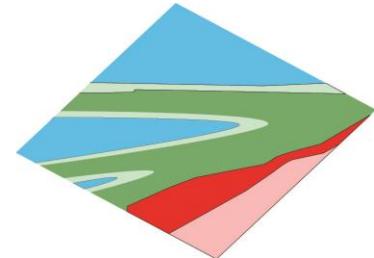


Regional Fold FB: Before 1742 Ma granite

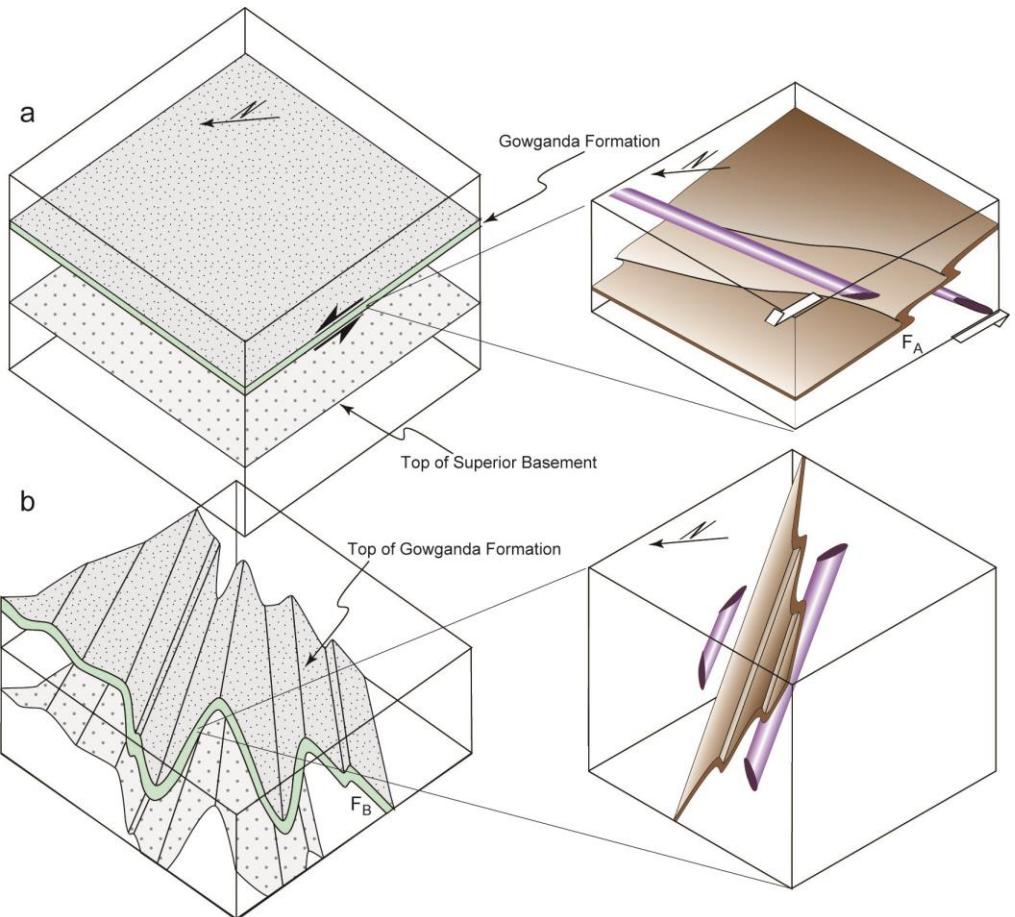
1850-1742 Ma

In Lake Superior area :
Penokean Orogeny 1890-1830 Ma

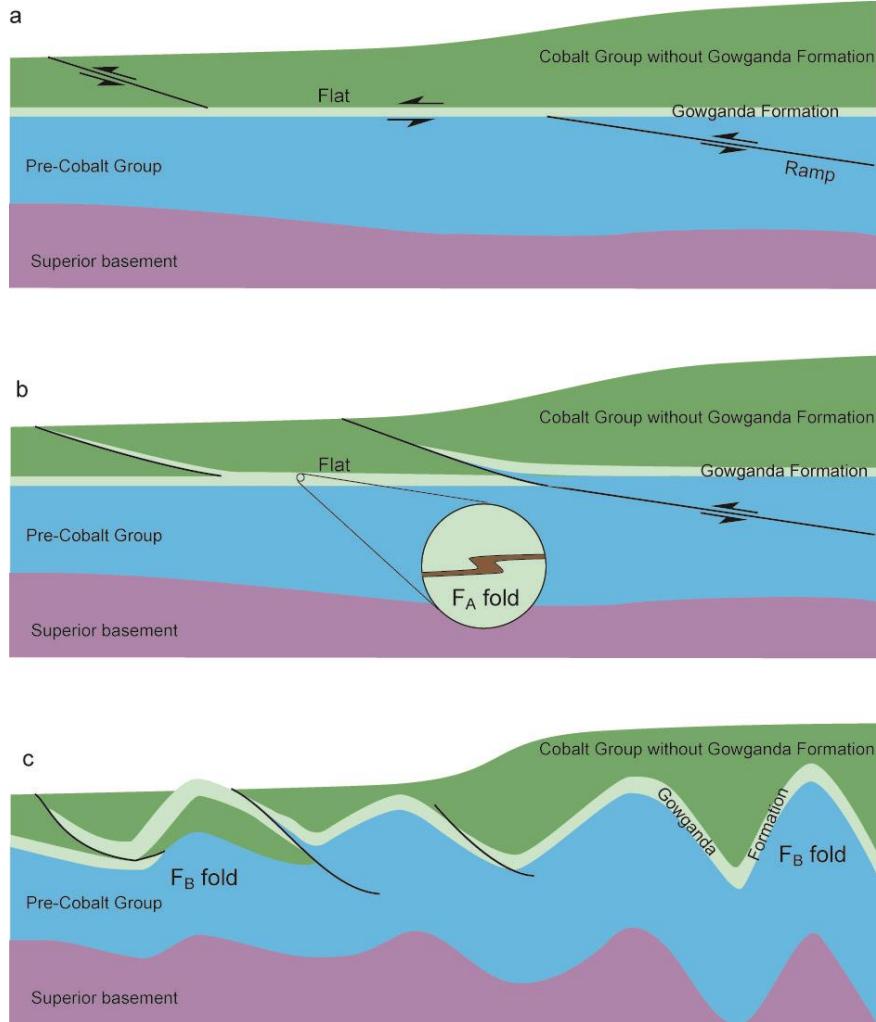
Here: 1850-1830 Ma



Gowganda Fold FA: After 1850 Ma Sudbury Impact



- Grenville Province
- 1742 Ma Killarney Granite
- Cobalt Group without Gowganda Formation
- Gowganda Formation
- Pre-Cobalt Group
- Superior Basement
- A bed in Gowganda Formation
- Nipissing Boudins
- Bedding trace



Tectonic Model: Fold-and-thrust belt

In the Penokean Orogeny between 1850 and 1830 Ma